Liquid Argon Test Facility (LArTF) Hazard Awareness Training Handout

[PDLAR001/CB/01]

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Overview

The cool down, filling and operations phases of the MicroBooNE experiment present many hazards. This document is intended to inform you of the potential hazards you may encounter in the LArTF and the proper precautions to take to prevent unsafe situations. Please read the entire document, complete the quiz, then sign and submit the signature sheet at the end. This training may also be taken online in the TRAIN system. This hazard awareness training is mandatory for all personnel who enter LArTF or work at LArTF routinely. It is valid for one year.

1. Introduction

This training document outlines the hazards specific to the LArTF and the MicroBooNE experiment.

Upon entering the building, always check the whiteboard (located on the loading dock) for the daily activities and hazards. If you may be creating any hazards with your work, inform the installation/commissioning coordinator (or designee) so that this information can be included on the whiteboard.

If you find a situation in which you need advice, training, review or a decision in regards to safety or safe operations, you should first go to your immediate supervisor/spokesperson. If you and your supervisor/spokesperson conclude that the matter goes beyond your own group, that you need assistance in resolving it, or that you need to arrange for safety training, you should contact the Particle Physics Division (PPD)/Neutrino Division (ND) Division Safety Officer (DSO). In the event of an emergency, you should call ext. 3131 from any Fermilab telephone.

Environmental Safety, Health & Quality (ESH&Q) materials referenced in this document can be consulted for guidance on ESH&Q issues. These materials can be found on-line at this URL: http://esh.fnal.gov/xms/

1.1. Programs for Controlling Hazards

The programs for controlling the hazards that may be found within the facilities generally have three parts: (1) reviews to minimize hazards of new systems; (2) personnel training; and (3) documented operating and safety procedures or guidelines to follow. In addition, work activities performed by Fermilab employees shall be reviewed via a Hazard Analysis (HA) before work is started (see Fermilab Environmental, Safety and Health Manual (FESHM) 2060 Work Planning and Hazard Analysis). Reviews to minimize hazards in the design, construction, and operation of new systems are conducted by specific review committees or Environmental, Safety, and Health (ES&H) personnel. If you are involved in an operation that you feel should be reviewed, contact your supervisor or the facility coordinator/spokesperson. Training courses are conducted by supervisors, the PPD/ND Division Safety Officer (DSO), or the Fermilab ESH&Q Section, depending on the specific need. Written procedures and job hazard analyses are usually developed by those doing the work and their supervisors, in consultation with ESH&Q personnel when necessary.

2. Hazardous Energy

Many components utilize potentially dangerous high voltages and/or currents. In addition, certain electrical devices/components may retain significant electric charge after their high-voltage sources are removed. These sources of energy can cause electric shock to personnel if work on these devices is carried out improperly. All personnel are required to have Electrical Safety Orientation [FN000387] Training, which is a brief orientation to the Fermilab Lockout/Tagout (LOTO) program and NFPA-70E for unqualified workers.

A common hazard is “daisy-chaining” of extension cords and power strips. Extension cords and power strips are designed to be used individually and not connected to others in series. Such improper installations can become a fire hazard by creating an over-current condition. Figure 1 shows examples of acceptable and unacceptable usages of extension cords and power strips. These are examples of configurations found onsite at Fermilab, however acceptable and unacceptable configurations are not limited to these examples. Contact the building manager if you have any questions.

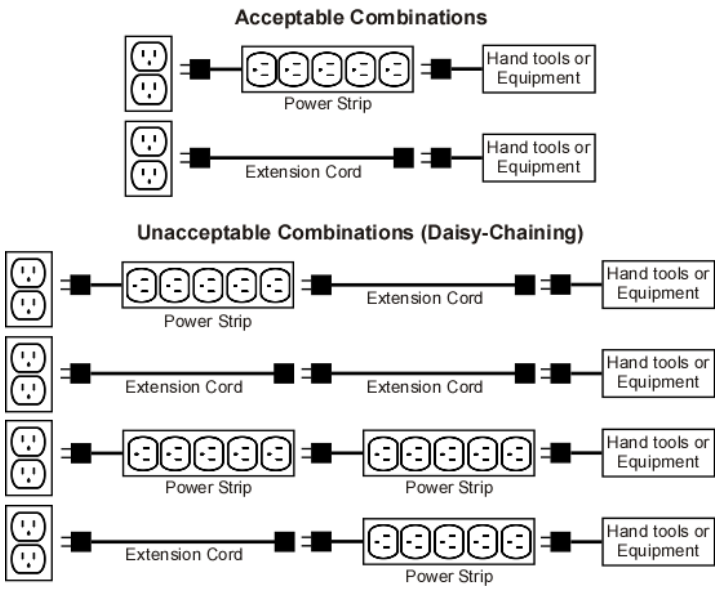

Figure 1. Examples of Acceptable and Unacceptable Combinations of Extension Cords and Power Strips.

People performing service or maintenance work on or near equipment that could cause them injury if it were to become energized must lockout and tagout that equipment's energy source(s) and must have current Fermilab LOTO Level 2 [FN000212] Training. Only LOTO Level 2 trained personnel are authorized to work on equipment that could become hazardous to them if that equipment were unexpectedly energized. LOTO requires the use of a designated red lock and a DANGER tag to isolate the hazardous stored energy source (e.g., electricity, gravity, springs). Additional information about LOTO can be found in FESHM 2100 Fermilab Energy Control Program (Lockout/Tagout).

> *NOTE: The term "configuration control" applies to the lockout and tagging of equipment to control the state or operation of equipment or systems where individuals are not actively engaged in servicing or maintenance. The application of "configuration control" locks should be implemented with a (non-red) padlock and a CAUTION tag. Configuration control locks and/or tags are applied by persons or groups authorized by line management, and are typically removed by the same person or group who applied the devices. (See the Appendix of FESHM Chapter 2100 for further details and examples of Configuration Control.)*

3. Radiation Hazards

A facility may contain areas where radiation hazards can be found. Radiation fields can also be found near activated objects and radioactive sources. The ALARA (As Low As Reasonably Achievable) concept is used to keep doses to radiation workers at a minimum. Certain training and dosimetry requirements area also put in place to help keep doses ALARA. See below for specific requirements.

Specific Radiation Hazards at the LArTF:

LArTF is located along the Booster Neutrino Beam (BNB). The beam neutrinos and interactions resulting from them do not pose a radiation hazard and LArTF is not a Radiation Area when the BNB is operating.

GERT is the only radiation safety training required to enter this facility.

There are no sources or source boxes located at LArTF.

4. Chemical Hazards

Small amounts of chemical materials, such as epoxies and solvents, are used or stored in certain areas. If handled incorrectly, some of these materials may become harmful. As a general practice, the use of combustibles should be limited. All hazardous (e.g., flammable, corrosive, reactive, or toxic) materials that are not in use must be stored in specially designated cabinets. Flammable liquids, such as ethanol, must be stored in a Flammable Liquids Cabinet. Figure 2 shows an example of a Flammable Cabinet. Rags or Kim Wipes used in the application or cleanup of such solvents must be collected, disposed of in flammable rag containers and must be emptied every night.

Safety Data Sheets (SDS's) containing information on all of these and other materials within the facility can be found online at http://www-esh.fnal.gov/pls/ip/msds_search.html. Additional information regarding chemical hazard communication is outlined in FESHM 4110 Hazard Communication.

Contact a Waste Generator or ESH&Q waste personnel for information about proper disposal of hazardous or unknown chemicals.

Figure 2. Example of a Flammable Cabinet.

5. Environmental Hazards

An accidental release of some materials (e.g., oil, gasoline, diesel fuel) from equipment could become harmful if it is not promptly contained. Such a release can be considered harmful if it can cause adverse effects to people or the environment. If you know or suspect that such a release has occurred or will occur, call ext. 3131 to report a spill emergency. Designated personnel are trained to execute procedures designed to minimize the spread of accidentally released materials. In addition, the following materials are prohibited from disposal in trash cans and dumpsters:

- all hazardous (e.g., flammable, corrosive, reactive, toxic) materials
- degreasing agents (e.g., Freon)
- uncured epoxy
- ethylene glycol (“anti-freeze”)
- fluorescent light bulbs
- oils
- paints
- pesticides
- radioactive material, radiation signs and labels

- scrap metal
- NiCad, lead/acid, and lithium batteries
- any free liquids (regardless of chemical nature)

Contact a Waste Generator or ESH&Q waste personnel for information regarding the proper disposal of such items. Whenever possible, please recycle rather than throw away materials that are no longer of use.

6. Hazards Associated with Operating Machinery

6.1. Cranes and Forklifts

Improper use of certain equipment, such as cranes and forklifts, can endanger people working in the area as well as material being moved. People operating cranes and forklifts must complete operator training and renew this training every three years. Operators must clear personnel from the area of the lift and warn others of approaching loads. All personnel are prohibited from the area near or under any suspended load. Personnel conducting or in the vicinity of overhead lifts or lifts that have the potential to contact the head must wear hard hats and safety shoes. Procedures for crane use can be found in FESHM 10100 Overhead Cranes and Hoists and FESHM 10140 Mobile Cranes.

7. Hazards Associated with Working at Heights

There are unusual places throughout the facility from which people or things have the potential to fall. These include ladders, scaffolds, personnel (aerial and scissor) lifts, etc.

Personnel lifts are available in some areas for workers trained in their use. Aerial lifts are devices used to elevate personnel to sites above ground, which use articulating or extendible boom platforms. Scissor lifts are mobile supported scaffolds, which can be powered or unpowered. Improper use or poor maintenance of either aerial or scissor lifts can pose a serious safety hazard. PPD employees and users who will utilize aerial/scissor lifts will receive training on the proper operating procedures, and hazards associated with the equipment and operating the equipment.

The physical condition of ladders and scaffolds should always be inspected prior to their use and must be used in accordance with all posted instructions and/or safety precautions.

Work from elevated platforms that have no railings requires Fall Protection Orientation [FN000304] Training, the use of a body harness and lanyard, and a written rescue plan in the hazard analysis. Hard hats must be worn whenever someone is working above you or during overhead rigging activities.

It is common for work to be conducted at elevations above floor level. When working with ladders, a number of rules apply:

- Always use the appropriate ladder for the job. Avoid reaching or leaning from a ladder to complete a task.
- When ladders are not in use, they must be stored in a secure location that will not cause an obstruction to walkways or workspaces.
- The physical condition of ladders and scaffolds should always be inspected prior to use and must be used in accordance with any posted instructions and/or safety precautions.

Specific Hazards Associated with Working at Heights at the LArTF:

Hard hats are required whenever working in an area where personnel lifts (such as aerial or scissor lifts) are in use. Fall protection is required when working with aerial lifts (boom or articulating).

Any ladder use on the surface or platform levels where the ladder is placed within a ladder-height distance from any guardrail must be used with fall protection.

Access to the built-in lower level of the platform is made by lifting out platform decking panels and stepping down. Once the decking panel has been removed, barriers must be constructed to warn others of the floor opening. The lower ledge has toe-kicks and guardrails; fall protection is not required.

Only individuals who have completed Fall Protection Orientation [FN000304] Training may use fall protection equipment.

8. Emergencies

Call ext. 3131 in the event of an emergency situation, such as personnel requiring medical treatment for any reason. Stay on the phone until the emergency operator indicates that s/he has all of the necessary information, including your name, location and nature of the emergency. Do not attempt to bandage another person or clean any bodily fluids from another person's injury.

When evacuating any area, proceed to the designated assembly point and wait there until the 'all clear' signal is given. If you must leave and can't wait for the 'all clear', tell your supervisor or an Emergency Warden. Rescue attempts will be made by the Fire Department if someone is unaccounted-for and believed to be in an unsafe area (e.g., burning structure, oxygen deficient area). If you notice that a fellow worker is missing during an emergency, immediately report this to an Emergency Warden, the Incident Commander (Fire Dept.) or the Fire Chief.

8.1. Fire Alarm

The fire alarm is a steady alarm that may be accompanied by a flashing strobe light. It means that smoke or fire has been detected in the area.

Specific Procedures for a Fire Alarm at the LArTF:

Upon activation of the fire alarm, immediately evacuate the building and gather at the emergency assembly area, located in the parking lot near the MiniBooNE enclosure.

8.2. ODH/Interlock Alarm

The ODH/interlock alarm is a whooper alarm that indicates an oxygen deficiency hazard (ODH) or other hazardous atmosphere. This alarm also acts as the interlock alarm.

Specific Procedures for an ODH/Interlock Alarm at the LArTF:

Upon activation of the ODH alarm immediately evacuate the building and gather at the emergency assembly area, located in the parking lot near the MiniBooNE enclosure.

8.3. Miscellaneous Alarms

Various other alarms exist throughout the building to provide other warnings (e.g. the ODH fan is not functioning, the emergency back-up generator is not functioning, etc.). If you notice any other alarm or flashing

red light, assemble on the surface level and contact one of the cryogenic experts listed on the call list next to the key tree panel. Do not attempt to enter the platform or pit levels until the source of the alarm has been verified by a cryogenic expert.

8.4. Sitewide Emergency Warning System (SEWS)

This is a verbal communication system broadcast throughout all areas of the laboratory. It is used to notify personnel when hazardous conditions exist and what protective actions to take. It is very important that you respond to its warning tones and messages and that you follow the transmitted instructions. If the nature of the message indicates severe weather, promptly go to the designated shelter for your area.

Specific Procedures for a SEWS Message at the LArTF:

Upon notification of a severe weather warning, follow directions to move into the designated shelter, which is located at the lower levels of either of the stairwells of LArTF. To access while the gate is closed, use the emergency key in the glass-fronted key box (Break the glass with the provided tool. Leave the key in the gate for any others who may need to enter the shelter). If already on the pit or platform level, move into the stairwells and get to the lower levels. Remain there until an all-clear is given. Notify the DSO after using the emergency key.

9. Cryogenic Hazards

There are areas within the facility where cryogens such as liquid nitrogen or argon may be routinely present. A leak of these materials can cause local zones of oxygen deficiency. In addition, there may be areas where acute physical hazards associated with handling cryogenic materials, such as burns to the eyes and skin, are present. When cryogenic materials are handled, appropriate PPE, such as gloves and protective eyewear with side shields, must be worn. Additional information regarding the controls and procedures required of cryogenic and ODH areas are contained in FESHM 5032 Cryogenic System Review and FESHM 4240 Oxygen Deficiency Hazards (ODH) (Work Smart Standard).

Specific Cryogenic Hazards at the LArTF:

In general, operation of the cryogenics system does not involve the handling of cryogens – contractors handle the delivery of liquid nitrogen and liquid argon to the designated storage dewars located outside the building.

During the cool-down and filling process, and during operations, the pit and platform levels have an ODH-1 rating. The surface level and stairwells have an ODH-0 rating.

To access ODH-1 areas, you must follow the two-person rule and obtain approval to work in those areas (from the Run Coordinator, Commissioning Coordinator, or designee). Upon approval and verification of ODH training (and medical clearance) completion, you will be given an access code. Use the access code to open the key tree. Remove a key and place your ID badge in the tree. Get an oxygen monitor and take it with you. [*NOTE*: If working in an area where you may not be able to quickly access the stairwell in the event of an emergency (e.g. working under the platform, on the scaffolding, or on a lift); you must take a rescue air pack with you.] After leaving the ODH-1 area, return your oxygen monitor and key to the key tree and retrieve your ID badge.

Leaks in valves or other connections may occur, particularly during the initial commissioning; such leaks can show as a persistent fog. If such a fog is observed, all those in LArTF must exit and the cryogenics support group informed of the problem.

10. Confined Spaces and Limited Access Areas

Confined spaces are locations in which hazards, such as poor illumination, difficult emergency escape and ODH, can be intensified. A written permit and Fermilab Confined-Spaces [FN000003] Training is required for access to any confined space. Additional policies and procedures regarding access to confined spaces can be found FESHM 4230 Confined Spaces.

Specific Confined Spaces and Limited Access Areas at the LArTF:

Access to the ODH-1 areas (pit and platform levels) requires O.D.H. Training [FN000029].

If working in an area where you may not be able to quickly access the stairwell (e.g. under the platform, on the scaffolding, or in a lift), carry a rescue air pack with you.

The LArTF sump pit is a confined space and requires a confined space permit in order to enter. Contact ESH&Q Confined Space personnel for permit approval.

11. Miscellaneous

The following describes some additional general hazards and work rules which exist within the facilities:

- Smoking at facilities is permitted only outdoors and at least 15 ft. from the nearest indoor entrance.
- All new visitors working at Fermilab must register with the Users' Office (Wilson Hall Mezzanine, ext. 3111) upon their arrival.
- It is always preferred that people not work alone. When this is impractical, workers should at least insure that another person, such as their supervisor, is aware of when and where they are working, and they should make arrangements to periodically check-in with that person. This is especially important for work during off-hours. Also note that for some types of jobs, explicit "two-man rule" requirements may exist.
- **Nothing** may be attached to or suspended from overhead sprinkler pipes.
- Since janitorial personnel do not service some areas within the facilities, you must clean up after yourself.
- Appropriate PPE must be worn to protect against hazards. Closed toe shoes are required at all times when in LArTF. Hard hats must be worn when working in the pit or on the platform level.
- Keep the roll-up door closed as much as possible to prevent stressing the Heating, Ventilation and Air Conditioning (HVAC) system.

12. LArTF Hazard Awareness Quiz

1) Who is required to complete this training?
    a) All Fermilab employees
    b) All visitors
    c) Anyone who routinely works at LArTF
    d) Both a & b

2) What actions should you take if you hear the tornado alert or sirens?
    a) Go outside to look for signs of tornadoes
    b) Take cover in the emergency shelter (the stairwells of LArTF)
    c) Curl into the fetal position and cry
    d) Get in your vehicle and drive home

3) What is the FIRST thing you should do if you hear a fire alarm at LArTF?
    a) Call the Fire Department
    b) Investigate if there is really a fire
    c) Evacuate the building and gather in the parking lot by MiniBooNE
    d) Call your supervisor/spokesperson

4) When is fall protection NOT required?
    a) When accessing the built-in lower level of the platform
    b) When using a ladder within ladder-height distance from any guardrail
    c) When working in boom or articulating aerial lifts
    d) All of the above

5) Who should you contact for information about proper disposal of hazardous or unknown chemicals?
    a) A Waste Generator
    b) ESH&Q waste personnel
    c) Your colleague
    d) No one, just throw them out
    e) Both a & b

6) What should you do in the event any person requires medical treatment?
    a) Panic
    b) Call the building manager
    c) Call the Main Control Room
    d) Call extension 3131
    e) Treat the person with a first aid kit

7) Where can you store a flammable liquid (e.g., ethanol, acetone) overnight?
    a) In a special cabinet designated for flammable liquid storage
    b) Anywhere, as long as it's labeled
    c) It's ok to leave in your work area
    d) In a toolbox
    e) Both c & d

8) It is acceptable to plug one electrical extension cord into a multiple outlet strip (power strip)?
    a) True
    b) False

9) Which of the following is NOT required to access ODH-1 areas at LArTF?
    a) A second person and approval
    b) A gate key and oxygen monitor
    c) A half-mask respirator and flashlight
    d) Current ODH training and medical clearance

10) What should you do if you find an unsafe situation?
    a) Stop work immediately and inform your supervisor or DSO
    b) Ignore it
    c) Curl into the fetal position and cry
    d) Immediately inform the Fire Department
    e) None of the above

13. Signature Page and Training Record

If you have not completed this training online, please complete the quiz and this form and return both to:

LArTF Hazard Awareness, MS 355
OR
Fax 630-840-8602

"I have read the **Liquid Argon Test Facility (LArTF) Hazard Awareness Training Handout** and understand the hazards present within the facility. Also, I agree to follow all of the listed work rules and emergency procedures."

Print your name: _____ Fermilab ID#: _____

Division/Section/Affiliation: _____ Department/Group: _____

Fermilab Phone #: _____ Mail Station: _____

Email address: _____

Your signature: _____

Today's date: _____ *(This training will expire one year from this date.)*

----------FOR ADMISTRATIVE USE ONLY----------

Course: Liquid Argon Test Facility (LArTF) Hazard Awareness Training [PDLAR001/CB/01]

Quiz score: _____/10 (score < 8 = fail)

TRAIN group assignment: _____

Authorization: _____
(Must be signed by ESH&Q personnel)